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ABSTRACT

The purpose of this booklet is to provide a definition of phonological and morphological principles governing the English spelling system. Included in the discussion are an exhaustive list of sound-to-spelling correspondences, lists of common prefixes and suffixes, and rules for combining affixes with base morphemes. Charts provided outline checked vowel correspondences, free vowel correspondences, correspondences for vowel-r combinations and consonants, common unstressed endings in monomorphemic words, prefixes, common nonpalatalizing suffixes, and symbols. (Author/KS)

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AN OUTLINE OF ENGLISH SPELLING

Paula Russell

ABSTRACT

Delineation of phonological and morphological principles governing the English spelling system is provided. Included in the treatment are an exhaustive list of sound-to-spelling correspondences, lists of common prefixes and suffixes, and rules for combining affixes with base morphemes.

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AN OUTLINE OF ENGLISH SPELLING

Paula Russell

English spelling ha been treated variously in the literature as a loosely ordered set of exception-riddled sound-to-spelling correspondences (Bloomfield, 1933; Horn, 1957), as a usually reliable set of sound-to-spelling correspondences (Hanna, Hanna, Hodges, & Rudorf, 1966), and as a very reliable system based both on sound-to-spelling correspondences and on morphological principles of English (Chomsky, 1970; Vachek, 1945-49; Halle, 1969). The last of these approaches offers the most adequate basis for describing English spelling with precision. While the theory involved with this approach has been described in the literature (Russell, 1972), the specific principles arising from it have not been delineated.

Generally, sound-to-spelling correspondences are predictive of the spellings of individual base morphemes, and derived words are spelled according to morphological principles, as described below:

1. Monosyllabic, monomorphemic words: Spelling is based on relationships of individual sounds and letters (i.e., sound-to-spelling correspondences). For example, the spelling of string involves the following correspondences: /s/ → s, /t/ → t, /r/ → r, /ɪ/ → i, and /ŋ/ → ng.[1]

2. Polysyllabic, monomorphemic words: Spelling of the stressed syllable is based on rules of correspondence, as described above. Spelling of the unstressed syllable is arbitrary, but choices are limited. For example, the spelling of market involves the correspondences /m/ → m, /ar/ → ar, and /k/ /C_ → k; the unstressed /ət/ ending might be spelled it, et, or perhaps ot, but not at, ut, VVt, or Vte.

3. Prefixed words: The base morpheme is spelled according to sound-to-spelling correspondences. Prefixes vary in vowel pronunciation but not in vowel spelling; their spelling is governed by morphemic identity rather than merely by sound. For example, misspell consists of the base spell and the prefix mis-. The base spelling is governed by sound-to-spelling correspondences. The prefix /mVs/ is always spelled mis. Prefix and base are combined to create misspell. (Note that the ss at the morpheme boundary is predictable only on morphological, not phonological grounds.)

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[1]Symbols used in this paper are defined and exemplified in the appendix.

4. Suffixed words: Spelling principles governing these words are similar to those governing prefixed words, with three added complexities. First, a number of suffixes are homophones. Normally, however, homophonous pairs have different functions (e.g., -ous is an adjectival suffix; -ess is a feminine nominalizer). Second, suffixes often cause stress changes in base morphemes; in such cases affix-aided spelling is of predictive value (e.g., spelling the o in ignorance on the basis of /o/ ignore). Third, special processes are involved in combining base and suffix (e.g., cry is changed to cri in cried; tie is changed to ty in tying).

5. Compounds: Morphemes are spelled independently according to sound-to-spelling correspondences. In roommate, for example, room and mate are spelled separately, then combined. No changes in either component result from combining them.

6. Foreign words: Some sets of foreign words, especially those from French and Greek, have spelling patterns that deviate from normal English rules of correspondence. These words often have stylistic characteristics that identify them. For example, French words often have luxury- or prestige-connoting characteristics, as in champagne, chauffeur, and chalet (note the French ch spelling for /š/). Greek words are often technical or scholarly, such as architect, monarch, and choreography (note the Greek ch spelling for /k/). (See Brengelman, 1971.)

There are, of course, exceptional spellings that defy analysis. These, however, are relatively few.

The discussion of spelling principles following proceeds much as described above. First, sound-to-spelling correspondences operable in base morphemes, including common foreign correspondences, are delineated. Unstressed endings common in two-syllable monomorphemic words (see 2, above) are then listed and discussed. Next, prefixes and prefixation rules are listed, followed by suffixes and suffixation rules.

CORRESPONDENCES OPERABLE IN BASE MORPHEMES

VOWELS

The English vowel system varies more from dialect to dialect than does the consonant system. Because of dialect mergers and splits, a pair of vowel spellings may be predictable for speakers of one dialect, but may be graphemic options for other speakers. In this paper, care has been taken to avoid over-simplification of sound-to-spelling correspondences; that is, only phonemic distinctions made by most Americans are noted. For example, /ɛr/, /ær/, and /er/ are considered identical, even though a few speakers may differentiate them and, thus, find their spellings more predictable. However, the vowel system used here will be over-differentiated for a few speakers. For example, /ɪ/ and /ɛ/ in

some dialects merge before /n/ (i.e., pin and pen are homophones); for these speakers, spelling words with in and en will be more difficult than is indicated here. In the discussion below, three groups of vowels are considered separately: checked vowels, free vowels, and vowel-r combinations. Following general discussion of the groups, specific vowel correspondences are delineated.

Checked Vowels

/ɪ/	(bit)	/ʊ/	(put)
/ɛ/	(bet)	/ʌ/	(but)
/æ/	(bat)	/ɑ/	(cot)

The checked vowels (sometimes called "short" vowels) are normally spelled with a single vowel letter. Most such vowel sounds have only one productive spelling. The checked vowel /ɑ/ is in some dialects homophonous to the free vowel /ɔ/; for speakers of these dialects, spellings for the two conflict, but each set is considered separately here. When a checked vowel with a one-letter spelling is followed by a single consonant and a vowel or by final /l/, /f/, /s/, /z/, /č/, /ǰ/, or /k/, the consonant spelling is doubled (see Consonants). Checked vowel correspondences are provided in Vowel Chart I, p. 7.

Free Vowels

/i/	(beat)	/(y)u/	(cute, boot)
/e/	(bait)	/o/	(boat)
		/ɔ/	(bought)
/ay/	(bite), /oy/	(boil), /aw/	(bout)

Free vowels are those which can occur finally. A subset of the free vowels is the "long" vowels: /e/, /i/, /ay/, /o/, and /(y)u/ (these correspond to the names of the vowel letters). Of the remaining vowels, /ɔ/ is unique in that it has phonological identity only for some speakers; for other speakers, it is indistinct from /ɑ/, and spellings associated with the two should be considered homophonous. Even speakers who do differentiate between /ɑ/ and /ɔ/ do not do so consistently from area to area, speaker to speaker, or word to word. Free vowels are usually spelled according to one or more of three patterns, all of which involve participation of more than one vowel letter:

1. V...e or V before CV, as in make or paper. These spelling patterns occur only for the "long" vowel subset of the free vowels.

In both instances, the resulting pattern is VCV; the second vowel letter marks the first as long. The letters r and l can also serve this marking function, as in April and table. In words like tape, kite, hope, and cute, the only function of e is to mark the first vowel letter as long (contrast tap, kit, hop, and cut, which have checked vowel sounds and no final e spelling). In words like paper, oval, tiny, and puny, the second vowel serves two functions, itself representing a sound while at the same time marking the first vowel as long.

2. VV, as in rain, ray, meal, coat, shout, cow, boy, and boil. This pattern is used for all free vowels. For long vowels, both this pattern and pattern 1, above, are used, creating a large number of homophones (e.g., mane-main, rode-road, etc.). However, for /oy/ and /aw/, only the VV spellings occur. In final position, the VV digraphs usually end in y (ay, ey, oy), w (aw, ew, ow), or less often, e (ie, oe, ue). When occurring medially, they usually end in i (ai, ei, oi), u (au, eu, ou), or, less often, a (ea, oa). The Vy-Vi pairs and the Vw-Vu pairs are final-medial representations of the same sounds; their environments are complementary. Two VV spellings, ee and oo, are reduplicative.

3. V(V)gh. The gh once represented the now lost phoneme /x/. Igh is fairly common, but eigh, ough, and augh occur fairly infrequently. These spellings occur only finally and before /t/.[2]

Phonological environments that most frequently constrain free vowel spellings are described below (slashes are omitted from notations to avoid visual clutter):

/_C#: Both V...e and medial VV (usually ending in i, u, or a) spellings occur here. Examples: came, aim, rode, road. Final /t/ and /n/, however, sometimes post special constraints, as noted below.

/_n#: Vw spellings may occur here. Otherwise, spellings are the same as before any other consonant sound. Examples: lawn, own.

/_t#: V(V)gh spellings may occur here. Otherwise, spellings are the same as before any other consonant sound. Examples: taught, light.

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[2]The V $\left\{ \begin{matrix} w \\ y \end{matrix} \right\}$ e sequence warrants comment as a pattern but is not useful insofar as correspondences are concerned. It applies only to content words consisting entirely of a single free vowel: awe, ewe, owe, aye, and eye.

/__CC: /ay/ and /o/ in this environment are normally spelled with a single vowel letter; other vowels are normally spelled VV. Examples: mind, lord, wild, cold, vs. paint, shield. The /st/ cluster sometimes operates differently from other clusters (e.g., the ee, ea, and a...e correspondences do not occur before clusters other than /st/).

/_C{V, r, l}: Normally a single vowel spelling occurs here. It is marked as free by the vowel, r, or l following. Examples: pony, paper, April, noble, acre. VV spellings occur in this environment very infrequently.

/_V: Either single vowel spellings (as in riot, chaos, and duet) or Vy or Vw spellings (as in mayor and sewer) occur here.

/_#: Final spellings usually are digraphs ending in y, w, or e. Examples: pay, low, tie.

Free vowel correspondences are listed on Vowel Chart II, p. 8.

Vowel-r Combinations

The pronunciation of a vowel is usually modified by a following /r/. In some instances this has no significant effect on spelling. For example, vowel sounds in cure and cute may be phonetically different but are phonemically identical; the phonetic difference is insignificant in terms of spelling, for /yu/ is spelled the same in the two words. In both cure and cute, the vowel and following consonant may be spelled separately according to rules of correspondence for each.

Some vowels, however, cannot be spelled according to regular vowel correspondences when they occur before /r/. These are dealt with separately from other vowel correspondences. The combination /ʌr/ is historically a merger of /ɪr/, /ɛr/, and /ʌr/; its spellings reflect the now lost distinctions (as in skirt, serve, and burn). In most dialects /ɛr/, /ær/, and /er/ have merged as well (e.g., for most speakers Terry, Harry, and Mary rhyme); this merger is referred to here as /Er/.

In Vowel Chart III, p. 15, all English vowel-r combinations are listed. Where /r/ does not significantly affect the spelling of the vowel, the reader is instructed to determine the spellings for the vowel and for /r/ separately, according to regular vowel and consonant correspondences. Where /r/ does significantly affect vowel spelling, correspondences for the /Vr/ combination are provided.

Use of the Vowel Charts

In the charts on the following pages, correspondences for checked vowels, free vowels, and vowel-r combinations are listed by phoneme and phonological environment (slashes are not used to denote phonemes in environmental notations to avoid excess visual clutter). Frequencies for each correspondence reflect the number of one or two syllable words in the Berdiansky, Cronnell, and Koehler lexicon (1969) in which the correspondence occurs: A = 200+, B = 100-200, C = 50-100, D = 25-50, E = 10-25, and F = 3-10. Frequencies are rough approximations. A count of applicable morphemes occurring in all words in the lexicon would yield very different figures; however, frequency values given are valid indicators of the relative importance of correspondences. Because environments for spellings are not always exclusive, environments for infrequent spellings which overlap with environments for productive spellings are asterisked. In addition, shading has been used in the "Spelling" column for clarification of predictability.

1. If there is only one unshaded spelling listed for a given environment, that spelling should be considered predictable for the environment cited.

2. If there are two unshaded spellings listed for a single environment, the two spellings should be considered graphemic options (viable alternative spellings).

3. If a spelling is shaded, its environment (asterisked) conflicts or overlaps with the environment of a more common (unshaded) spelling, but its frequency is so low that it should not be considered a viable alternative spelling.

Comments on spellings are provided to explain idiosyncracies, to clarify environments, etc. Exception lists provided are fairly exhaustive of irregular morphemes.

Vowel Chart I: Checked Vowel Correspondences

Sound	Environ.	Spelling	Freq.	Examples	Comments	Exceptions
/ɪ/	initial, medial	i	A	crisp, ill	In some dialect areas, /ɪ/ and /ɛ/ have merged, particularly before /n/, thus making i and e graphic options.	England, women, build, busy, breeches, pretty, been
		y	E	myth	This is a Greek spelling occurring primarily in words with academic or technical uses.	
/ɛ/	initial, medial	e	A	enter, bed	See comment for i, above.	said, friend, leopard, any, many, heifer, again
		ea	C	bread	This correspondence usually occurs before /d/, /θ/, and /z/ (s), and in morphemes in which ea represents /i/ as well as /ɛ/ (e.g., heal(th), mean(t), deal(t), etc.).	
/æ/	initial, medial	a	A	ant, last		plaid, laugh, calf, half, comrade
/ʊ/	/__ {d, k}	oo	D	good, hook	Environments for these spellings are not mutually exclusive. However words which contain both the final and initial constraints are few. For some speakers, especially of Southern dialects, the environment for oo should also include /m/ and /f/.	foot, bosom, could, would, should, woman, cushion, wolf, sugar
	{p, b, f} —; / __ #	u	E	put, bush, full		
/ʌ/	/__ C ≠ v, ð	u	A	sun, dust, up		among, from, stomach, flood, blood, color, of, dozen, was, what
		ou	E	young, double	This correspondence originates from French, but its exemplars are often common English words (i.e., they cannot be recognized on the basis of stylistic features).	
	/__ {v, n, ð}	o	C	other, shovel, son	This correspondence arose from the difficulty of reading uv and un in medieval script. Before /v/ and /ð/, the o spelling is predictable; before /n/, both the u and o spellings occur.	
/ɑ/	initial, medial	o	A	otter, stop	For some speakers /ɑ/ and /ɔ/ are indistinct; for these speakers, o and spellings for /ɔ/ are graphic options (see correspondences for /ɔ/, page 12).	father, drama, llama, amen, calm, balm, psalm, yacht

Vowel Chart II: Free Vowel Correspondences--/i/

Sound	Environment	Spelling	Freq.	Examples	Comments	Exceptions
/i/	/__ {st; CX ≠ CC#; in monosyllables}	ea	A	beast, each, tea	The notation /_CX ≠ CC# means that the spellings can occur before any consonant not participating in a final cluster (/st/, of course, is excluded from this restriction). In the medial environments, ea is slightly more common than ee; in the final environment, ee is more common than ea.	beard, key, people
		ee	A	beet, see		
	*/__C	ie	F	relief	These four environments overlap with the above environment. Because of this and because all the spellings are low frequency, they are considered unpredictable. The ei spelling usually occurs in the morpheme ceive/ceit, thus accounting for the "i before e except after c" rule. The ie spelling occurs most often before /t/ and /v/. The e...e spelling, though it follows the regular V...e free vowel pattern, is comparitively rare, occurring primarily in technical words of Greek origin. i...e normally occurs in academic words of French origin. The single e spelling for final /i/ occurs only in five function words: he, me, she, be, and ye.	
		ei	E	deceive, deceit		
	*/__C#	e...e	D	sphere, here		
		i...e	F	ravine, machine		
	*/__C {V; r; l}	e	E	meter, zebra, eclipse		
	*/__#, in monosyllables	e	F	he		
	/__CC ≠ st	ie	F	fiend, pierce	Though infrequent, this correspondence is predictable. Its environment complements the environment for ee and ea.	
	/__V	i		stadium	No frequencies are given for these correspondences because the spellings occur only in words of more than two syllables. The i spelling is far more common. Both originate from Greek or Romance languages and occur primarily in scholarly or technical words.	
		e		museum		
	/__#, in polysyllables	y	B	silly	Final -y also occurs as an adjectival suffix, as in lucky. In either case final y is sometimes pronounced /ɪ/ rather than /i/, depending on dialect; regardless of this variance, the correspondence is predictable.	
		ey	E	valley		

Summary: The major spellings for /i/ are ee and ea, occurring finally in monosyllables as well as medially, and y, occurring finally in polysyllables.

Vowel Chart II, continued: Free Vowel Correspondences--/e/

Sound	Environment	Spelling	Freq.	Examples	Comments	Exceptions
/e/	/__ { C / st / ð } #	a...e	A	cake, waste, bathe	The ai spelling is more common before /l/ and /n/; otherwise, the a...e spelling is more common.	crepe, fete, reign, mesa, break, great, steak, ancient, cafe, chaos, sundae
		ai	B	pain, rail, waist		
	/__CC	ai	F	paint	Though infrequent, this correspondence is predictable.	
	/__C { V / r / l }	a	C	taper, April, table		
	*/__C	ei	F	veil, rein	This rare correspondence conflicts with those above. It complements the equally rare ey spelling for final /e/.	
	/__ { V / # }	ay	C	mayor, stay	The ay spelling complements the ai spelling, above.	
	*/__ { t / # }	eigh	F	eight, weigh		
	*/__#	ey	F	they, obey	This spelling complements medial ei.	
		et	F	ballet	The et ending is a French spelling occurring in words connoting prestige or luxury.	

Summary: The primary spellings for /e/ are a...e and ai, occurring before final consonants, a, occurring before medial consonants, and ay, occurring finally.

Vowel Chart II, continued: Free Vowel Correspondences--/(y)u/

Sound	Environ.	Spelling	Freq.	Examples	Comments	Exceptions
/(y)u/	/__C#	oo	C	boot	/u/ may be spelled either oo or u...e, but /yu/ must be spelled u...e, never oo.	do, to, who, you, move, prove, flu, menu, truth, vacuum, queue, view, tomb, two, cuckoo, beauty, canoe, shoe, through Tuesday.
		u...e	C	cute, tune		
	/__C {V, l}	u	D	super, buple	The oo spelling occurs in this environment only in poodle, noodle, and oodle; u is the regular spelling.	
	/__CC	oo	F	boost	Though infrequent, this correspondence is predictable	
	*/__C	ui	F	juice	This environment overlaps with those above, but the spellings listed here occur very infrequently. The ui and ou spellings originate from French; however, their exemplars are so common that they carry no specialized connotation. The eu spelling is from Greek; it occurs primarily in academic or technical words.	
		eu	F	neutral, Europe		
		ou	F	soup, cougar		
	/__V	u	E	duet, ruin, fuel	These two spellings are graphic options. A complexity associated with them is that after /(y)u/, the consonants /r/ and /l/ may be simple consonants or syllabics. Thus, jewel, fuel, mule, and drool may rhyme, as may sewer and pure. For speakers who do not differentiate among these sets, the spellings listed here conflict with u...e and oo, above, when occurring before /r/ or /l/. (See page 35).	
		ew	F	sewer, jewel		
	/__#	ew	D	few, flew	The ew spelling often, but not always, marks a past tense; ue never does. The ew spelling also occurs before /n/ in some participial forms, like strewn and hewn, but this is a morphologically based spelling and one that occurs infrequently. An oo spelling occurs finally in a few borrowed and imitative words (e.g., bamboo and moo, respectively), but these are exceptional. Of the two listed spellings, ew is the more common in words of one syllable; ue is the more common in polysyllables.	
		ue	E	blue		

Summary: The major spellings for /(y)u/ are u...e and oo, occurring before a final consonant, u, occurring before a medial consonant, and ew and ue, occurring finally.

Vowel Chart II, continued: Free Vowel Correspondences--/o/

Sound	Environment	Spelling	Freq.	Examples	Comments	Exceptions
/o/	/__C#	o...e	B	vote	These two spellings are graphic options.	yeoman, yolk, folk, comb, gross, beau, plateau, bureau, door, floor, dough, though, through chauffeur, both, oh, bowl, sew, four, soul
		oa	C	coal		
	*/__l#	o	F	roll, control	Following this infrequent correspondence, final /l/ is spelled with a doubled consonant in one-syllable words; in two-syllable words, /l/ is spelled l. This is unusual in that doubling normally follows checked vowels. This correspondence conflicts with those above.	
	/__C{V, r, l}	o	C	open, cobra, noble		
	/__CC	o	D	most, fold	For /o/ before /rC/ see vowel-r spellings. oa occurs only before /st/ clusters; ou occurs only before /lC/ clusters. Both conflict with o, which occurs before both /st/ and /lC/ clusters.	
		oa	F	boast		
		ou	F	mould		
	/__V	o	F	poet		
	/__#	ow	C	tow, yellow	The ow spelling occurs in native English words. Final o occurs in a few function words and a number of borrowed words. Final oe is generally restricted to two-phoneme, one syllable words.	
		o	D	go, solo		
		oe	F	hoe		

Summary: The productive spellings for /o/ are o...e and oa, occurring before a single final consonant, ow, occurring finally, and o, occurring elsewhere.

Vowel Chart II, continued: Free Vowel Correspondences--/ɔ/

Sound	Environment	Spelling	Freq.	Examples	Comments	Exceptions
/ɔ/	/w__	a	D	want, squash	Though in many dialects /ɔ/ and /ɑ/ have merged, creating a number of ambiguous spellings, this correspondence is predictable regardless of dialect.	solder, broad, cough, trough
	/__C ≠ n, k	au	D	haul, taut, sauce, auburn	This correspondence conflicts with /ɑ/ correspondences for speakers not differentiating between the two phonemes. Compounding the complexity is the fact that several of the correspondences below for /ɔ/ overlap this one.	
	*/__l	a	F	malt, tall	The aw spelling occurs before final /l/; a and au occur before final /lC/ as well as final /l/ (above).	
		aw	F	shawl, bawl		
	*/__t	ough	F	thought	These two spellings occur only in past tense words. Both conflict with au, above, and with o for speakers who do not differentiate /ɔ/ and /ɑ/.	
		augh	F	caught		
	*/__ {ŋ, g, f, θ, s}	o	C	long, dog, off, moth, moss	Speakers who normally distinguish between /ɔ/ and /ɑ/ often do not do so before voiceless fricatives and voiced velars. This correspondence is superfluous for speakers who never differentiate between /ɑ/ and /ɔ/.	
	/__n#	aw	F	drawn, lawn	This correspondence is infrequent but predictable for speakers who differentiate between /ɔ/ and /ɑ/.	
	/__k	aw	F	hawk		
		al	F	talk		
	/__#	aw	E	straw	The ah spelling occurs primarily in expletives. The aw spelling should be considered the predictable one, even for speakers who have merged /ɔ/ and /ɑ/.	
		ah	F	bah		

Summary: Correspondences for /ɔ/ are complexly interrelated, and nearly all spellings for the phoneme occur very infrequently. Complexity is compounded for speakers who do not differentiate /ɑ/ and /ɔ/. No shading has been used in the chart above because few spellings can be predicted with accuracy, even for speakers who do differentiate between /ɑ/ and /ɔ/ consistently. For all speakers, two spellings however, are predictable: a after /w/ and aw finally.

Vowel Chart II, continued: Free Vowel Correspondences--/ay/

Sound	Environ.	Spelling	Freq.	Examples	Comments	Exceptions
/ay/	/__C#	i...e	A	bite, mine	The i...e spelling is predictable except before final /t/; igh (see below) is more common in that environment. The y...e spellings occurs in academic and technical words from Greek.	lye, bye, rye, eye, I, hi, island, aisle, isle, kayak, height, buy, guy
		y...e	F	lyre, type		
	*/__t#	igh	D	light, sight	This spelling conflicts with i...e above. The igh spelling is more frequent than i...e before final /t/; otherwise, i...e is predictable before final consonants.	
	/__CC	i	D	mind, child		
	/__V	i	E	riot, quiet		
	/__C {V, r, l}	i	C	tiger, vibrate, title	The y spelling, like the y...e spelling, above, occurs primarily in academic or technical words of Greek origin.	
		y	E	hygiene, hydrant, cycle		
	/...C__#	y	D	cry, rely	The y spelling for final /ay/ is predictable when /ay/ is preceded by a consonant cluster or an entire syllable, but the spelling does not normally occur when the entire word consists of /Cay/. (The function words my and by are exceptions).	
	/#C__#	ie	F	pie, tie	This environment complements the one above. However, none of the numerous spellings for this environment is frequent enough to be considered predictable. Buy, guy, my, and by fit this environment but are idiosyncratic. My and by are function words; function words often have shortened spellings.	
		igh	F	high, sigh		
		ye	F	rye, lye		

Summary: Productive spellings for /ay/ are i...e before a final consonant (conflicting with igh before final /t/), i in other medial environments, and y, occurring finally in words of more than two phonemes. Final /ay/ in two-phoneme words has a number of unpredictable spellings. y is substituted for i in words of Greek origin.

Vowel Chart II, continued: Free Vowel Correspondences--/oy/, /aw/

Sound	Environment	Spelling	Freq.	Examples	Comment	Exceptions
/oy/	/__C	oi	D	coin		oyster, buoy
	/__ {V, #}	oy	D	boy, foyer		
/aw/	/__ {#, n#, l#, V}	ow	C	allow, frown, growl, flower	The spelling of /aw/ before /r/ is dependent on the spelling of /r/. If /r/ is spelled r, the second /aw/ correspondence applies; if /r/ is spelled er, the first /aw/ correspondence applies. See page 31.	foul, thou, crowd
	elsewhere	ou	B	found, out, flour		

Summary: All spellings above are predictable according to environment.

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Vowel Chart III: Correspondences for Vowel-r Combinations

Sound	Environment	Spelling	Freq.	Examples	Comments	Exceptions
/ɪr/	----------				Before /r/, /ɪ/ and /i/ have merged. See correspondences for /i/ and for /r/.	
/ɛr/	----------				See /Er/, below.	
/ær/	----------				See /Er/, below.	
/ur/	----------				Before /r/, /ʊ/ and /u/ have merged. See correspondences for /u/ and /r/.	
/ʌr/	/w__	or	E	worm		were, borough, thorough, martyr, syrup, myrrh
	not /w__ (elsewhere)	er	C	insert, her	The ur and ir spellings are most common in monosyllabic words. The er spelling occurs primarily in more technical Latinate words, which are usually polysyllabic. Spellings for /ʌr/ reflect the pronunciations of vowels before they merged. All spellings but ear occur medially and finally; ear occurs only before a consonant.	
		ur	C	burn, fur		
		ir	D	thirst, fir		
		ear	E	earth		
/ar/	initial, medial, final	ar	C	art, carve, tar	Normally, /a/ is spelled o. This correspondence is unusual in that /a/ is spelled a.	bazaar, are, heart, hearth
/ir/	----------				See correspondences for /i/ and for /r/.	
/er/	----------				See /Er/, below.	
/Er/	/__V	arr	E	carry	In most dialects /ɛr/, /ær/, and /er/ have merged, producing what is referred to here as /Er/. Spellings reflect the original phonemic distinctions. For example, a in vary, a...e in care, and ai in air are normal spellings for /e/; e in berry and ea in bear are normal spellings for the checked vowel /ɛ/; a before a doubled consonant in carry is the usual spelling for /æ/. In dialects where these vowel distinctions are still made, the spellings are predictable.	ere, where, there, scarce
		ar	F	vary		
		err	F	berry		
		er	F	perish		
	/__#	are	D	care		
		air	D	fair		
		ear	F	bear		

Vowel Chart III, continued: Correspondences for Vowel-r Combinations

Sound	Environment	Spelling	Freq.	Examples	Comments	Exceptions
/ɔr/	----------				Before /r/, /ɔ/ and /o/ have merged. See correspondences for /or/, below.	
/or/	/w__	ar	D	quart, warn, wharf	This is one of two correspondences conditioned by a prevocalic /w/ and a post-vocalic /r/ (see also the correspondence for /ʌr/). Exceptions to this correspondence are morphologically based; inflections of verbs ending in ear are normally spelled with final ore or orn, whether or not they have a prevocalic /w/ (as in swear-swore-sworn, wear-wore-worn, tear-tore-torn, etc.).	wore, worn, swore, sworn, or, nor, for
	/__C	or	B	fort	Spellings for /o/ before /rC/ are the same as spellings for /o/ before any consonant cluster (cf. correspondences for the free vowel /o/).	
		our	E	court		
		oar	F	board		
	/__#	ore	D	sore	These correspondences are the same as those for the free vowel /o/ preceding a consonant. Simple or occurs finally only in three function words: or, for, and nor.	
		oar	F	boar		
/(y)ur/	----------				See correspondences for /(y)u/ and /r/.	
/ayr/	----------				See correspondences for /ay/ and /r/.	
/awr/	----------				See correspondences for /aw/ and /r/.	

CONSONANTS

Constraints for consonant correspondences are generally far less complex than those for vowel correspondences. Most consonants are spelled with a single consonant letter or digraph. The three general principles described below account for most of the variation in consonant spellings.

Consonant Doubling

All consonants other than /v/, /š/, /ž/, /θ/, /ð/, and /ŋ/, can "double" graphically in specific environments. Normally, doubling results in reduplicated letters (pp, bb, tt, dd, gg, ff, ss, zz, rr, ll, mm, and nn), but in a few instances "doubled" consonants are not truly doubled: "doubled" k is ck, "doubled" ch is tch, and "doubled" g (/ǰ/) is dg(e). The two circumstances[3] which typically cause doubled spellings are as follows (hereafter referred to as CDR-1 and CDR-2, respectively).

1. /C/ → CC /V_c — $\left\{ \begin{matrix} C \\ \# \\ V \end{matrix} \right\}$ (a consonant is doubled when following a checked vowel spelled with a single vowel letter and when preceding a syllabic consonant or a vowel)

Examples: wicked, tunnel, kitchen, midget, cabbage, vassal, dollar, gizzard, blossom, cannon, gallop, maggot, shabby, dizzy, dazzle, bubble

This rule is similar to suffixation process 11, page 41. It is most reliable when the consonant precedes a syllabic /l/ ending (as in little), or a vowel spelled with the letter e (as in kitchen) or y (as in silly). Doubling is less predictable before vowels spelled with a or o (e.g., lizard vs. gizzard and atom vs. blossom). Before vowels spelled with the letter i, doubling is the exception rather than the rule. Based on a count of doubled consonants in the monomorphemes listed in the Berdiansky et al. lexicon (1969) CDR-1 is 99% accurate for consonants preceding le, 86% accurate for consonants preceding e or y, 66% accurate for consonants preceding a, 63% accurate for consonants preceding o, and only 23% accurate for consonants preceding i.

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[3]Consonant doubling also occurs in a small number of two-phoneme content words. In English, only function words may be spelled with fewer than three letters; this principle accounts for doubled consonants in ebb, egg, add, odd, inn, and err.

2. /C/ → cc /V$_{c}$__#, where /C/ is /s/, /l/, /f/, /z/, /k/, /ǰ/, or /č/

(a final consonant is doubled when following a checked vowel spelled with a single vowel letter if the consonant is one of those listed; this rule applies only to monosyllabic words.)

Examples: miss, will, sniff, buzz, lick, badge, patch

Letters With Dual Functions

For readers as well as spellers, the letters c and g have two functions. When preceding i, e, or y, these consonant letters usually have "soft" pronunciations (/s/ and /ǰ/, respectively); when preceding other letters, the pronunciations are "hard" (/k/ and /g/, respectively). The result of this duality for spellers is that s and c as well as g and j overlap in use before front vowels.

Consonant Diacritic e

Final e is frequently used to mark vowels as free (see Vowels). It may also be used to mark some consonants.

ve: the letter v is not allowed in final position in English words; instead ve is used (as in serve and have). The use of e after v has no phonological relevance; it is purely a graphic convention.

se: a single final s normally represents the suffix -s (as in pleas); therefore, se is used in place of s to clearly indicate an unsuffixed word (as in please).

ze: convention has it that single final z does not occur (quiz is an exception); instead, the ze spelling is used. As in the case of final ve, the use of e after z has no phonological relevance.

ce: single final c represents /k/ in English orthography (as in arc); e added to c "softens" the c so that it represents /s/ (as in farce).

ge: single final g represents /g/ in English orthography (as in hug); e added to g "softens" the g so that is represents /ǰ/ (as in huge).

The e consonant diacritic (as in lunge) and the e vowel diacritic (as in mule) can overlap in function. In words like huge, face, haze, wise, and save, final e serves two functions: it is part of the vowel spelling as well as part of the consonant spelling.

Use of the Consonant Chart

Correspondences operating within base morphemes (affixes are excluded) are listed according to sound and environment. Environments provided are phonological unless symbols are underlined; underlined symbols are graphic (in some instances spellings of other parts of a word must be chosen before consonant spellings can be predicted). The symbol "V_c" represents a checked vowel spelled with a single vowel letter; the symbol "V_f" represents a free vowel sound without regard to spelling.

A spelling should be considered predictable if it is the only unshaded spelling listed for a given environment. If two or more unshaded spellings occur for a specific environment, they are considered graphic options. A shaded spelling is one that occurs relatively infrequently so that it only negligibly inhibits the predictability of unshaded spellings.

Comments offered in the consonant chart explain environments, provide relative frequencies of spellings, and describe other features of correspondences, as pertinent. Exceptions (morphemes with unaccounted for spellings) exclude violations of CDR-1.

Consonants are ordered in the chart according to place and manner of articulation.

Correspondences for Consonants--/p/, /b/, /t/, /d/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/p/	/V$_c$— {V, le}	pp	happy, topple	See CDR-1, page 17.	
	elsewhere	p	ripe, caper, pin, lip		
/b/	/V$_c$— {V, le}	bb	rubber, nibble	See CDR-1, page 17.	
	elsewhere	b	robe, able, sob, bed		
/t/	/V$_c$— {V, le}	tt	ditty, bottle	See comments for CDR-1, page 17. Intervocallically /t/ and /d/ often merge, becoming a flap, as in metal and medal; however, the vowel quality is affected by the medial consonant so that the difference is perceptible. The occurrence of bt finally in debt and doubt is a result of false etymologies.	debt, doubt, yacht, receipt, two
	elsewhere	t	heat, cater, rat, ten		
/d/	/V$_c$— {V, le}	dd	ruddy, paddle	See CDR-1, page 17. as well as comments for /t/, above.	
	elsewhere	d	lady, ladle, day, rid		

Summary: All consonants on this page are subject to CDR-1 but not CDR-2. Spellings for all are predictable. (All suffixes, including -ed, are excluded from this analysis.)

Correspondences for Consonants, continued--/g/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/g/	/#__{i, e, y}	gu	guide, guest, guy	The environment for these correspondences is graphic rather than phonological. In this environment the letter g can represent either /g/, as in get, or /ǰ/, as in gem. The gu spelling was a partial attempt to disambiguate the g spelling. In modern English, /g/ before i, e, and y can be spelled gu or g; gu is slightly more common.	ghost, guard
		g	giddy, get		
	/#__{C, a, o, u}	g	glare, gas, got, gun	The environment for this correspondence complements the environment for the preceding correspondence.	
	/V (c)__{V, le}	gg	dagger, wiggle	See CDR-1, page 17.	
	/V (f)__#	gue	plague, rogue	A simple g spelling in this environment would result in spellings like plage and roge, which closely resemble spellings for /ǰ/ in page and huge. The u is used after g to prevent readers from "softening" g; g before e is nearly always pronounced /ǰ/.	
	elsewhere	g	eager, anger, vulgar, bargain, dig, rag		

Summary: The spelling of /g/ is very much like the spelling of /p/, /b/, /d/, and /t/. All are normally spelled with a single consonant letter unless CDR-1 applies; if the latter is the case, all are spelled with a doubled consonant. However, in a small number of words, the spelling of /g/ is subject to special rules, associated with the ambiguity of the letter g for readers. Before i, e, or y, the letter g usually represents the /ǰ/ sound; therefore the gu spelling is sometimes used for /g/ in this environment to avoid ambiguity. With the exception of the first two correspondences listed above, all are predictable according to environment.

Sound	Environment	Spelling	Examples	Comments	Exceptions
/k/	/__w	q	quit, square	The sequence /kw/ is always spelled qu; this is the only use of the letter q in English. Therefore, q is always followed by u.	disc, raccoon, soccer, stucco, yucca, burdock, derrick, hammock, hassock, khaki, kodak, okra, skate, skull, skunk, kayak, zinc
	see comments	x	axis, six	The x spelling is used for a combination of phonemes: /ks/. This combination must occur within a morpheme (as in tax), not across morpheme boundaries (as in tacks). This is the only letter in English used to represent two sounds.	
	/ {#, C, V_f} __			The given environment (initially or following a consonant or free vowel) is a general one applicable to the two correspondences below.	
	/__ {i, e, y, ɘ}	k	kit, skirt, market, hanky, sky, bark, naked, hike, week	The general environment above is phonological; this environment is graphic. The spelling of the vowel following /k/ must be determined before the /k/ spelling is determined.	
	/__ {a, o, u (≠ /w/), c (≠ /s/)}	c	can, cob, cut, scare, scout, scuba, scrape, class, pecan, circus, bacon	Again, the specific environment here is graphic rather than phonological. This correspondence does not operate when /k/ precedes /w/ (see notes for q, above) or when /k/ precedes /s/ (see notes for x, above.) Exceptions to this correspondence are primarily personal names, trade names, and rather exotic foreign terms.	
	$/V_c$ __			The environment given here is a general one applicable to the two correspondences below. Spellings listed below occur only when following a checked vowel spelled with a single vowel letter.	
	/__ {#, in monosyllables; V; le}	ck	tack, bicker, freckles	This correspondence is approximately equivalent to CDR-1 and CDR-2 (see pages 17-18).	
	/__#, in polysyllables	c	sumac, havoc, panic	This correspondence complements the correspondence above.	

Correspondences for Consonants, continued--/k/ (continued)

Sound	Environment	Spelling	Examples	Comments	Exceptions
/k/	initial, medial, final	ch	chorus, ache, orchestra	The ch spelling for /k/ occurs in words of Greek origin. Most have technical or academic connotations.	
	medial	qu	croquet, conquer	The qu spelling for /k/ is French in origin and occurs primarily in words with prestigeous connotations.	
	final	que	antique, plaque	This spelling parallels the one above.	

Summary: /k/ is normally spelled k before front vowels, q before /w/, c before back vowels, k after free vowels and consonants, and ck after checked vowels. All correspondences other than the three shaded foreign spellings are predictable on the basis of environment. The foreign spellings occur infrequently.

Correspondences for Consonants, continued--/f/, /v/, /θ/, /ð/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/f/	/V$_c$—{V, le, #}	ff	taffy, baffle stiff	See CDR-1 and CDR-2 pages 17-18.	cough, draught, enough, laugh, rough, tough, through, sapphone, chef, if
	elsewhere	f	wife, leaf, fish	The f spelling is by far the most frequent spelling for /f/. The ph spelling is Greek, occurring primarily in academic or technical words. The f spelling should be considered predictable.	
		ph	phone, philosopny, aphid, graph		
/v/	/__#	ve	serve, have, live, leave	With the exception of rare modern coinages like rev, the letter v never occurs finally. A final /v/ is always spelled ve; if final e is already present as part of a vowel spelling (as in save), the e serves to mark the v as well. /v/ is one of the few phonemes not subject to CDR-1; v is never doubled, perhaps to avoid confusion with w.	of
	elsewhere	v	vote, clever		
/θ/	initial, medial, final	th	thin, three, ether, bath	This correspondence is completely predictable without consideration of environment.	
/ð/	/__#	the	bathe, seethe	Final e may serve as a vowel diacritic as well as part of the consonant spelling. In bathe it has both functions; in seethe it is unnecessary as a vowel marker.	smooth
	elsewhere	th	this, brother	Initial /ð/ occurs only in function words, but its spelling is predictable.	

Summary: With the exception of the Greek ph spelling for /f/, all spellings on this page are predictable. /f/ is subject to CDR-1 and CDR-2; /v/, /θ/, and /ð/ are not subject to any doubling rule.

Correspondences for Consonants, continued--/s/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/s/	/ {#, V_f, C} ___			This general enviornment (initially or following a free vowel or consonant) applies to the four correspondences below.	muscle, psalm, gas, bus, yes
	/__ {i, e, y}	s	sit, seal, syrup, basin, tonsil, tinsel	Before front vowels (environments given are graphic rather than phonological), /s/ can have any one of the three spellings listed. The most common spelling for initial /s/ is s, which occurs far more frequently than the other two. The c spelling is the most common of the three in intervocalic position. The sc spelling occurs rarely in any position.	
		c	cite, celery, cycle, acid, faucet, cancel, parcel, fancy		
		sc	science, scene scythe, crescent,		
	/__ {a, o, u, C}	s	say, sob, sub, bison, sausage, parson, sting, list	Before consonants and back vowels (environments given are graphic rather than phonological), the s spelling is predictable.	
	/__l	st	castle, wrestle	A syllabic /l/ ending may be spelled le or, el, or il (see page 34). When the le spelling is used, a preceding /s/ is spelled st; when the el spelling is used, /s/ is spelled ss after a vowel and c after a consonant. None of these spellings occurs with great enough frequency to be considered predictable.	
		ss	tassel		
		c	cancel		
	/V c {#, in monosyllables, V}	ss	pass, blossom	See CDR-1 and CDR-2, pages 17-18.	
	/V c {#, in polysyllables}	s	crocus, trellis, Texas	CDR-2 is rarely operable in words of more than one syllable. The single s spelling is more common for single morphemes in the given environment than the ss spelling. However, three suffixes end in ss: ness, less, and ess.	
		ss	cypress, trespass		

Correspondences for Consonants, continued--/s/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/s/	/C__#/	se	tense, else lapse, horse	Only the se spelling occurs after /p/ and /l/. Both spellings occur after /r/ and /n/. The ce spelling is most common after /n/. The final e in both spellings is a consonant marker. Single final s is a suffix; final se never denotes a suffix (e.g., tens vs. tense). Single final c spells /k/. The addition of e marks the /s/ pronunciation for readers (e.g., arc vs. farce).	answer, sword
		ce	dance, scarce		
	/V_f__#/	ce	race, rice, reduce, choice, fleece, piece	Again, single final s or c cannot be used to spell final /s/ in a morpheme. An e is added to the spellings to disambiguate them for readers; in words like race, base, rice, dose, final e marks the vowel as well (see Vowels). The ce spelling occurs after a...e, i...e, u...e, oi, ee, and ie; the se spelling occurs after a...e, o...e, u...e, ou, oo, and ea. These environments are too complex to be used for predictive purposes.	
		se	base, dose, use, house, moose, lease		

Summary: The major spelling for initial /s/ is s (this spelling is predictable in any position before consonants and back vowels). For medial /s/, s and c co-occur following free vowels and consonants; ss occurs in accord with CDR-1. For final /s/, major spellings are ss after checked vowels, and se or ce after free vowels and consonants. The suffix -s is, of course, excluded from this analysis.

Correspondences for Consonants, continued--/z/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/z/	/#__	z	zip, zone	This spelling is predictable.	cleanse, bronze, as, has, his, is, was, scissors, dessert, possess, whiz, quiz
	/C__	s	jersey, pansy	This environment is rarely applicable finally; therefore cleanse and bronze are treated as exceptions. The letter z almost never occurs before or after consonants.	
	/__C	s	husband		
	$/V_f$__V	s	drowsy	The s spelling is the more common in this environment, but not frequent enough to be considered predictable.	
		z	cozy		
	$/V_f$__#	se	fuse, wise, pause, pose, bruise, noise, raise	Generally, the se spelling occurs for /z/ in environments where it is not used for /s/ (see /s/ in the same environment); the ze spelling normally occurs where se does occur for /s/. In any case, se is the most common spelling for final /z/, but it does not occur with enough exclusivity to be considered predictable. Final e is part of these two correspondences because single s and single z do not normally end morphemes; the e functions as a vowel marker as well as a consonant marker in words like fuse, wise, haze, and prize.	
		ze	haze, prize, breeze, ooze		
	$/V_c$__(#, V, le)	zz	buzz, dizzy, drizzle	See CDR-1 and CDR-2, pages 17-18. Function words like was and is are exceptions.	

Summary: The only spelling for initial /z/ is z. The s spelling is also predictable preceding or following a consonant. Intervocallically, s and z are graphic options following free vowels, and zz is used following checked vowels, in accord with CDR-1. In final position, zz occurs following checked vowels, in accord with CDR-2; ze and se are graphic options following free vowels.

Correspondences for Consonants, continued--/š/, /ž/, /č/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/š/	initial, medial final	sh	ship, wish	When /š/ results from palatalization at a morpheme boundary, this correspondence does not apply. See pages 44-45.	licorice, ocean, sure, sugar
		ch	chalet, sachet	This is an infrequently occuring French spelling. Words containing it normally connote luxury.	
/ž/	final	ge	rouge, corsage	This sound has questionable phonemic status in English. It occurs under two circumstances: when /z/ merges with /y/, usually at morpheme boundaries (this is not dealt with here--see pages 44-45), and when a word borrowed from the French is given its French pronunciation. The examples cited here may be pronounced with final /ǰ/ or /ž/, depending on idiolect. Regardless of pronunciation the ge spelling is predictable (see also correspondences for /ǰ/).	
/č/	/V$_c$— {# V}	tch	batch, kitchen	The tch spelling functions as a "doubled" ch. See CDR-1 and CDR-2, pages 17-18.	much, rich, such, which catsup
	elsewhere	ch	chair, march, peach	This correspondence does not apply when /č/ results from palatalization at a morpheme boundary. See pages 44-45.	

Summary: The palatal consonants can result from consonant mergers at morpheme boundaries; such mergers are excluded from this analysis (see pages 44-45). All spellings above occur within morphemes, and all but the foreign ch spelling for /š/ are predictable. /č/ is subject to CDR-1 and CDR-2.

Correspondences for Consonants, continued--/ǰ/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/ǰ/	/#__ {i, e, y}	g	ginger, gem, gym	This spelling ambiguity is associated with the reading ambiguity of the letter g which represents both /ǧ/ and /ǰ/ (see correspondences for /g/). The distribution of the letters g and j is similar to the distribution of the letters c and s (see correspondences for /k/ and /s/).	major, rajah
		j	jig, jet		
	/#__ {a, o, u}	j	jam, jog, just	This correspondence is entirely predictable.	
	/ {C, V_f} __ {i, e, y}	g	engine, agent, orgy	This enviornment closely resembles the first environment listed above. The j spelling cannot be used morpheme medially, however, so this correspondence is predictable.	
	/ {C, V_f} __ {a, o, #}	ge	sargeant, surgeon, large, seige, rage	The letter e is added to g in this environment to disambiguate the spelling for readers; a simple g spelling would reflect the /g/ sound (e.g., sargeant vs. vulgar, rage vs. rag). In words like rage, the e marks both the vowel and the consonant.	
	/V_c__ V	dg	midget, cudgel	The dg spelling functions as a doubled consonant in medial environments (see CDR-1).	
	/V_c__#	dge	badge	The dge spelling functions as a doubled consonant in final environments (see CDR-2).	

Summary: Like the palatal consonants on the preceding page, /ǰ/ may be created as a result of merger across morpheme boundaries; such instances are dealt with on pages 44-45. All spellings above except those for initial /ǰ/ before front vowels are predictable according to environment. Like /č/, /ǰ/ is subject to CDR-1 and CDR-2.

Correspondences for Consonants, continued--/h/, /w/, /y/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/h/	/#__	h	hit	This correspondence is almost entirely predictable. In heir, honor, honest, herb, and hour, h is silent, corresponding to no sound, and is therefore unpredictable.	who, whole
/hw/, /w/	/#__	w	wine, went	For speakers who differentiate consistently between /w/ and /hw/, these two correspondences are entirely predictable. For speakers who do not make the distinction, the correspondences conflict. In any case, w occurs far more frequently than wh. The wh spelling occurs most often in "question words" (like when, where, why, etc.) and in words imitative of fast, airy sounds (like whip, wheeze, whisper, etc.).	
		wh	whine, while		
	/ {k, g} __	u	quite, penguin	The sequence /kw/ is always spelled qu in English. The u spelling for /w/ is also used consistently when following the other velar, /g/.	
	elsewhere	w	swift, twin	When /w/ occurs between vowel sounds, its spelling is part of the spelling of the preceding vowel (as in power and jewel) and so is not dealt with here (see Vowels).	
/y/	/C__	i	fiord, onion	This correspondence occurs infrequently within morphemes but is quite common in suffixes (see page 44).	canyon, señor
	elsewhere	y	yam	When /y/ occurs between vowel sounds, its spelling is part of the spelling of the preceding vowel (as in foyer and mayor) and so is not dealt with here (see Vowels).	

Summary: The letter h is the only productive spelling for /h/. /w/ and /y/ each have two productive spellings: u or i, respectively, after specified consonants, and w or y elsewhere. The w and wh spellings are graphic options, however, for speakers who do not differentiate between initial /w/ and /hw/.

Sound	Environment	Spelling	Examples	Comments	Exceptions
/r/	/#__	r	rat	The r spelling should be considered predictable in initial position, for wr occurs infrequently. Many words beginning with wr connote a twisting or turning motion.	colonel, corps, myrrh
		wr	wring		
		rh	rhyme	This infrequent spelling occurs primarly in academic terms of Greek origin.	
	/V_c__ V	rr	hurry	See CDR-1, page 17.	
	/ {aw, u} __	r	flour, pure	After many free vowels, /r/ may be pronounced as a syllabic or simple consonant. After most free vowels the spelling is invariantly r, but after /aw/ or /u/, the spelling may be r or er. Occurrences of these spellings are unpredictable, for r may represent a syllabic /r/ and er may represent a simple /r/. The choice of spellings for /r/ affects the spelling of the vowel preceding (e.g., ou can occur only before a consonant letter; ow occurs before vowel letters).	
		er	flower, sewer		
	elsewhere	r	brave, cart, her		
/l/	/V_c— {V, #}	ll	collar, tall	See CDR-1 and CDR-2.	dial
	/ {aw, u} __	l	howl, tool	Following many free vowels, /l/ may be pronounced as a simple consonant or a syllabic (see comments for /r/ in the same environment). In either case the spelling is simple l after most free vowels. However, after /aw/ or /u/ the spelling is arbitrarily l or el. The spelling for /l/ in these environments can affect the spelling of the vowel preceding.	
		el	towel, fuel		
	elsewhere	l	plate, halt tailor		

Summary: Both /r/ and /l/ are normally spelled r and l, respectively, unless a consonant doubling rule is operable. /r/ is subject only to CDR-1; /l/ is subject to both CDR-1 and CDR-2. Either consonant may be pronounced as a syllabic after free vowels; after /aw/ and /u/, spellings for the consonants are unpredictable.

Correspondences for Consonants, continued--/m/, /n/, /ŋ/

Sound	Environment	Spelling	Examples	Comments	Exceptions
/m/	/V$_C$— V	mm	summer	See CDR-1.	
	elsewhere	m	many, humid, rum, camp		
		mb	crumb	Silent final b and n are usually retrievable by means of affix-aided spelling (e.g., crumb-crumble, autumn-autumnal). The mb and mn spellings occur infrequently and only in medial and final position.	
		mn	autumn		
/n/	/#—	n	not		
		kn	know	The n spelling is by far the more frequent and should be considered predictable. The kn spelling arose from a now lost /kn/ cluster. The exceptional gn spelling occurs primarily in uncommon words of French origin.	Wednesday, sign, campaign, champagne, foreign, gnat, gnaw reign
	/V$_C$—V	nn	funnel	See CDR-1.	
	elsewhere	n	danger, snap, want, pan		
/ŋ/	/— {g, k}	n	ankle, anger	In this environment, [ŋ] is actually a conditioned allophone of /n/ ([n] never occurs before velars).	tongue
	elsewhere	ng	sing		

Summary: /m/ and /n/ are subject to CDR-1 but not CDR-2. With the exception of kn, mb, and mn, all of which are relatively rare, all listed correspondences for the two phonemes are predictable. The other nasal, /ŋ/, is not subject to any consonant doubling rule; its spellings, too, are predictable.

COMMON UNSTRESSED ENDINGS IN MONOMORPHEMIC WORDS

For purposes of discussion, suffixes are defined as word-final elements which occur after free or recurring bound bases. Endings are word-final elements preceded by syllables which cannot properly be termed bases because they do not recur. Suffixes usually have identifiable meanings or functions; endings have no identifiable meaning or function. Common word endings containing the unstressed vowel /ə/ (or /ɨ/, depending on dialect) are listed by pronunciation in the following chart. A given pronunciation often has two or three alternate spellings. One spelling is generally far more frequent than others. The listed endings can be divided into two categories: those which signal doubling of a preceding consonant in checked-vowel/consonant sequence and those which do not (see consonants). Endings which signal doubling are asterisked in the chart.

Common Unstressed Endings in Monomorphemic Words

Sound	Spelling	Comments	Examples	Exceptions
/ə/	a	This ending occurs in words of foreign extraction. Occurrences, however, are numerous.	lava, drama	rajah
/əd/	id	These endings are homophonous to the suffix -ed. Id is more common than ad.	rapid, candid	period
	ad		salad, ballad	
/əj/	age*	Age also occurs as a suffix.	garbage	
/ək/	ic	Ic also occurs as a suffix.	panic, clinic	hammock
/əl/	le*	Le occurs after stops, /t/, and sometimes /s/ and /z/; el occurs after resonants, affricates, /ʃ/, and sometimes /s/ and /z/. Le is by far most common, il least.	battle, waffle, castle	
	el*		channel, satchel, ravel	
	il		pencil	
/əm/	om	Om is the most common. Um and em normally occur in words of Greek or Latin extraction; most are academic or technical.	bottom	rhythm
	um		serum	
	em		system	
/ən/	en*	En also occurs as a suffix; as an ending it is more common than in or on.	garden, kitchen	organ, bargain
	in		satin, robin	
	on*		button	
/əp/	op*	This ending occurs infrequently.	gallop	tulip
/ər/	er*	All three endings also occur as suffixes. As endings, er is by far the most common, ar least.	wonder, panther	
	or		author, prior	
	ar		sugar, cougar	
/ərd/	ard		coward	

Sound	Spelling	Comments	Examples	Exceptions
/əs/	us	The us ending occurs mainly in technical words of Latin origin. Ous also occurs as a suffix. Ice is relatively infrequent.	calculus	analysis
	ous		jealous	
	ice		office	
/əst/	est	Est also occurs as a superlative suffix.	harvest	
/ət/	et*	Et is the more common.	blanket	patriot, bigot
	it		bandit	
/əš/	ish	Ish also occurs as a suffix. As a suffix, it signals consonant doubling; as an ending it does not.	radish	

PREFIXES

In a prefixed word, spellings of the prefix and base must be analyzed separately. The base is spelled according to rules of correspondence. The prefix has a fixed spelling that varies only when assimilation of the prefix-final consonant occurs. Though pronunciation of prefix vowels varies, vowel spellings are constant.

Prefixes can be divided into three general categories according to graphic characteristics. The most complex task in spelling prefixed words is determining the morphemic identity of the prefix. Sound alone may be adequate for prefix identification; for example, /rɪ/, /rɛ/, or /rə/ beginning a polysyllabic word is nearly always the prefix re-. Where sound alone is not predictive, base identification can help to identify a prefix by process of elimination. For example, scribe is the base of describe; therefore, the prefix is /də/ (de-) rather than /dəs/ (dis-). On the other hand, honest is the base of dishonest; therefore the prefix is /dəs/ (dis-) rather than /də/ (de-). Meaning may also be of value in prefix identification. For example, /prə/ in predict means "before" and is therefore the prefix pre-; however, /prə/ in promote means "forward" and is therefore the prefix pro-. Categories, their members, and spelling principles are delineated below.

Prefixes

1. Vowel-ending prefixes.

Prefix	Vowel pronunciations	Approximate meaning	Examples
a-	/ə/	"-ing" or "on"	afloat, afoot
be-	/ə/, /ɪ/	before	
e-	/i/, /ɛ/, /ə/	"out"	eclipse, elevate, elect
de-	/i/, /ɛ/, /ə/	"down" or "away"	detour, deluge, delight
re-	/i/, /ɛ/, /ə/	"again" or "back"	rewrite, relevant review
se-	/i/, /ɛ/	"against"	secret, select
pre-	/i/, /ɛ/, /ə/	"before"	prehistoric, president, preside
pro-	/o/, /a/, /ə/	"forward"	pronoun, prospect, promote
to-	/ə/	"this"	today

Spelling principles

a. These prefixes are simply conjoined to bases; no doubled consonant ever results at the prefix-base boundary.
b. After these prefixes /sV/ is spelled cV, or rarely scV, as in recite and descend; /zV/ is spelled sV, as in reserve.

2. Consonant-ending prefixes which do not assimilate to bases.

Prefix	Vowel pronunciations	Approximate meaning	Examples
al-	/ə/ or /ɔ/	"all"	altogether
for-	/o/	"for"	forever
un-	/ə/	"not"	unneeded
trans-	/æ/	"across"	transport
mis-	/ɪ/	"badly" or "wrongly"	misspell
non-	/ə/	"not"	nonsense
super-	/u/-/ə/	"over"	supervise
sur-	/ə/	"over"	surround
per-	/ə/	"through" or "thoroughly"	perceive, perfume

Spelling principles

These prefixes concatenate without change in spelling. This can sometimes result in a doubled consonant at the prefix-base boundary, as in unneeded, misspell, and surround.

3. Consonant-ending prefixes which assimilate to the first base consonant.

Prefix	Vowel pronunciations	Prefix variants	Approximate meaning	Examples
ex-	/ɛ/, /ɪ/	ef-/_f	"out"	export, exact effect
dis-	/ɪ/	dif- /_f	"not"	dishonest difficult
en-	/ɛ/, /ɪ/	em- /_m	"cause to(be)"	enable employ
in-	/ɪ/	im- /_m im- /_p il- /_l ir- /_r	"in," "not"	inlet, insane immature import, impolite illegal irregular
con-	/ə/, /ə/	co- /_V com- /_m com- /_p com- /_b col- /_l cor- /_r	"with"	confirm cooperate commute compose combine collaborate correct
syn-	/ɪ/	sym- /_m syl- /_l	"with," "same"	synonym symbiosis syllogism
inter-	/i/-/ə/	intel- /_l	"between"	international intellect
sub-	/ə/	suf- /_f sup- /_p suc- /_c sug- /_g su- /_s	"under"	submarine suffix suppress succeed suggest suspect
ob-	/ə/, /ə/	of- /_f op- /_p oc- /_c	"against"	object offend oppress occur

ad-	/æ/, /ə/		"toward"	adhere
		ab- /_b		abbreviate
		ac- /_c		accustomed
		ac- /_k		acknowledge
		ac- /_q		acquire
		af- /_f		affect
		ag- /_g		aggravate
		al- /_l		allow
		am- /_m		ammunition
		an- /_n		announce
		ap- /_p		appoint
		ar- /_r		arrange
		as- /_s		assign
		at- /_t		attempt

Spelling principles

a. Consonant pronunciation variations are represented in spelling.
b. If the last consonant of the prefix is the same as the first consonant of the base, consonant doubling at the morpheme boundary occurs.

SUFFIXES

In a suffixed word, base and suffix must be dealt with separately. Bases are spelled according to sound-to-spelling correspondences. When suffixation causes stress changes in the base (as in presíde-président), the spelling of the stressed vowel in the base word alone predicts the spelling of the unstressed vowel in the base of the suffixed word and vice versa (i.e., the i spelling is predictable is preside but not in president; the first e spelling is predictable in president but not in preside). Suffix spellings are fixed in accord with function as well as sound. For example, /ɨst/ following a base is spelled est if it is the superlative inflection meaning "most" (as in nicest) and is spelled ist if it is an agentive nominalizer meaning "one who" (as in artist). In homophones like banned and band or tacks and tax, suffix function is an essential determinant of the whole word spelling. A base and suffix are sometimes simply conjoined, but frequently, suffixation rules must be applied.

The chart on pages 42-43 lists common suffixes and their pronunciations. Notes on differentiating homophonous suffixes are provided. Listed below are regular suffixation rules for non-palatalizing suffixes, followed by a description of the operations of palatalizing suffixes.

Suffixation Rules for Non-palatalizing Suffixes

Concatenation:

1. If a base ends in a consonant identical to the first consonant of a suffix, a doubled consonant results at the morpheme boundary (e.g., carefully, meanness).

Operations with base-final e:

2. If a base ends in Ce, the e is dropped before a vowel-beginning suffix (e.g., writer, communism, driving), unless the base ends in ce or ge and the suffix begins with a, o, or u (e.g., changeable, outrageous, peaceable).

3. If a base ends in Ce, the e is not dropped before a consonant-beginning suffix (e.g., useless, nicely, refinement).

4. If a base ends in ue, the e is dropped before any suffix (e.g., argument, truly, rescuing).

5. If a base ends in ie, the e is dropped before a suffix beginning with e (e.g., tied), but ie is changed to y before a suffix beginning with i (e.g., tying, lying).

6. If a base ends in ee, oe, or ye, e is dropped before a suffix beginning with e (e.g., freer, hoed, dyed), but not before a suffix beginning with any other letter (e.g., agreeable, agreement, seeing, hoeing, dyeing).

Operations with base-final y:

7. If y ending a base is not pronounced before a suffix, it is graphically deleted (e.g., charity-charitable, pacify-pacific).

8. If a corresponding pronunciation change occurs, y is changed to ic before a suffix (e.g., apply-application, magnify-magnificent).

9. Except in cases described by 7 and 8, above, a base ending in y is not changed before a suffix beginning with i (e.g., trying, worrying).

10. In cases other than those described in 7, 8, and 9, above, y changes to i before a suffix (e.g., easily, silliness, worrier, cried).

Consonant doubling:

11. If a base ends in one vowel letter and one consonant letter, the consonant is doubled before some vowel-beginning suffixes. Suffixes which signal doubling are the vowel-beginning inflections (e.g., robbed, swimming, saddest, redder, bitten), the y suffix (e.g., sunny), and most suffixes beginning with the letter e (e.g., rotten, winner). Suffixes beginning with a and o signal doubling erratically; suffixes beginning with i do so rarely.

12. Base-final c (/k/) changes to ck (/k/) before a suffix beginning with i or e (e.g., picnicking, mimicked, trafficking).

Other operations:

13. When a base ends in t, g, or d followed by unstreesed Vr, the V is often lost before a derivational, vowel-beginning suffix (e.g., laundry, wondrous, waitress, tigress, angry, wintry). This is usually reflected in the pronunciation of the suffixed forms.

14. Base-final t changes to c and vice versa when a corresponding change in pronunciation occurs (e.g., science-scientist, prophet-prophecy).

15. Base-final f changes to v when a corresponding pronunciation occurs (e.g., knife-knives).

16. Base-final le changes to ul or to il when corresponding pronunciation changes occur (e.g., circle-circulate, able-ability).

Common Non-palatalizing Suffixes

Suffix	Pronunciation*	Examples	Comments
-ful	/fʊl/	joyful	
-dom	/dəm/	wisdom	
-less	/lɪs/	useless	
-ly	/li/	barely friendly	
-man	/mən/	salesman	-man is singular; -men is plural.
-men	/mən/	salesmen	
-ment	/mɪnt/	argument	
-ness	/nɪs/	kindness	
-s	/s/, /z/	hits, cans	Possessive suffixes (determined according to sentence context) are homophonous with these.
-es	/əz/	bushes	
-ship	/šɪp/	friendship	
-teen	/tin/	sixteen	
-th, -eth	/θ/,/əθ/	sixth, sixtieth	
-ty	/ti/	sixty	
-ward	/wərd/	northward	
-able	/əbəl/	available	-able follows syllables with free or unstressed vowels; -ible follows syllables with stressed checked vowels.
-ible	/əbəl/	flexible	
-age	/ɪǰ/	usage	
-al	/əl/	natural renewal	
-en	/ɪn/	fallen golden sadden	-en and -an are differentiated on the basis of function; -an is a nominalizer; -en is not.
-an	/ɪn/	Roman	
-ance	/əns/	entrance	These homophones are not differentiated in any systematic manner.
-ence	/əns/	residence	
-ant	/ənt/	servant ignorant	These homophones cannot be differentiated in any systematic manner; however, bases taking -ant often also take -ance and bases taking -ent often also take -ence.
-ent	/ənt/	president excellent	
-er	/ər/	nicer writer	-er and -or overlap in function, but -or usually follows ct, ate, it, or ute; -er usually does not.
-or	/ər/	actor	-ar is normally adjectival; -er and -or are usually agentive or, for -er only, comparative.
-ar	/ər/	circular	
-ary	/ɛri/	primary	-ary, -ery, -ory and -ry are homophonous in some occurrences of each.
	/əri/	rotary	
	/ri/	boundary	
-ery	/əri/	cannery	
	/ri/	bakery	
-ory	/ori/	observatory	
	/əri/	armory	
	/ri/	victory	
-ry	/ri/	poetry	

*/ɪ/ and /ə/ vary according to dialect.

-ate	/et/	assassinate	
-ate -ite	/ɪt/ /ɪt/	fortunate favorite	-ate is far more common than -ite.
-ed	/t/ /d/ /ɪd/	passed rolled wanted ashamed ragged	
-ude	/ud/	longitude	
-ute	/ut/	resolute	
-ern	/ərn/	western	
-ess -ous	/ɪs/ /əs/	waitress marvelous	These are differentiated on the basis of function: -ess is a feminine nominalizer; -ous is adjectival.
-est -ist	/ɪst/ /ɪst/	saddest druggist	These are differentiated on the basis of function: -est is a superlative inflection; -ist is an agentive.
-ette	/ɛt/	marionette	
-y -ie -ee	/i/ /i/ /i/	sunny brownie employee	These are usually differentiated on the basis of function: -y is usually adjectival, ie diminutive, and -ee agentive.
-ify	/əfay/	notify	
-ing	/ɪŋ/	writing	
-ish	/ɪš/	childish	
-ism	/ɪzəm/	communism	
-ity	/əti/	purity	
-ive	/ɪv/	active	
-ize	/ayz/	civilize	

Operations of Palatalizing Suffixes

Suffixes beginning with an underlying /y/ merge with base-final alveolar stops and fricatives to produce palatalized consonants. Most such suffixes are allomorphs of other suffixes, to which a preceding i or u has been added: -ial, -ian, -iant, -iary, -iate, -ience, -ient, -ual, and -uate. Other palatalizing suffixes are -ion and -ure (these are not allomorphs of other suffixes). The underlying /y/ beginning these morphemes is apparent in words like brilliant, rebellion, and annual. The palatalizing process results in the following grapheme-phoneme correspondences.

c + i = /š/	as in electric + ian		
ss + i = /š/	as in impress + ion		
st + i = /sč/	as in quest + ion		
t + i = /š/	as in penitent + iary		
s + i = /ž/	as in televise + ion	(in most of these words, the s ending the base arises from an underlying d--e.g., conclude-conclusive-conclusion)	
g + i = /ǰ/	as in reg + ion		

ss + u = /š/	as in press + ure	
s + u = /ž/	as in expose + ure	
t + u = /č/	as in architect + ure	
d + u = /ǰ/	as in grade + ual	

The spellings of suffixed words like those above requires morphological analysis--i.e., identification of bases and suffixes. Unless the base ends in a palatal consonant (as in freshen), the following rules apply to morpheme boundaries.

1. /š/ at a morpheme boundary is spelled

   ci if the base alone ends in c(e) or ct, as in electrician, official, sufficient, suspicious

   ti if the base alone ends in t, as in partial, penetentiary, illustration, election

   ssi if not followed by /ər/ and if the base alone ends in ss as in impression, or if the base is mit, as in permission.

   ss if followed by /ər/, as in pressure

   si if the base alone ends in Cd or Cse, as in expansion and tension.

2. /č/ at a morpheme boundary is spelled

   ti unless followed by /u/ or /ər/, as in question, Christian

   t if followed by /u/ or /ər/, as in architecture.

3. /ž/ at a morpheme boundary is spelled

   si unless followed by /u/ or /ər/, as in artesian, explosion

   s if followed by /u/ or /ər/, as in usual and pleasure.

4. /ǰ/ at a morpheme boundary is spelled

   du if the base alone ends in d(e), as in graduate

   gi if followed by /ən/, as in region.

Generally, the spelling of the consonant at the morpheme boundary is determined by the sound of the consonant before the suffix is added. Spellings for /š/ are somewhat arbitrary when bases are bound; in such cases, ti and ci vary freely after free vowels and consonants, but only ss may follow a checked vowel.

CONCLUSION

Like any oral language system, the English spelling system is complex in that it is based on the phonology, morphology, syntax, and to some extent the stylistics of the spoken language. Good spellers have a tacit knowledge of the principles delineated here, just as articulate speakers have a tacit knowledge of the principles of English grammar.

This paper is not an attempt to define "spelling rules" for pedagogical purposes. Rather, it sets forth the specific principles operating in the orthography, which may serve as a basis or reference for pedagogists, for researchers, and for those interested in statistical determination of the regularity of English spelling. Too often, principles of English orthography have been delineated without regard to the environmental or morphological constraints attendant upon them. Resulting from such simplistic analyses are the notions that the orthography is highly irregular and that teaching spelling by principles is, at best, ineffective and, at worst, misleading. Careful analysis of the principles cited here will reveal that, though the orthography is complex, it is highly systematic.

APPENDIX

Symbols

Symbol	Example	Symbol	Example
Vowel sounds		Consonant sounds	
/æ/	bat	/b/	boy
/ɛ/	bet	/č/	chair
/ɪ/	bit	/d/	do
/a/	pot	/f/	fat
/ʌ/	but	/g/	go
/ʊ/	put	/h/	hit
/e/	bait	/ǰ/	jet
/i/	beet	/k/	kiss
/o/	boat	/l/	let
/u/	boot	/m/	man
/yu/	cute	/n/	no
/ɔ/	bought	/ŋ/	sing
/av/	bite	/p/	pan
/ow/	bout	/r/	rat
/oy/	boy	/s/	sit
/ə/	around, chicken (frequently varies with /ɪ/)	/š/	ship
		/t/	to
/E/	the first vowel sound in Terry, Harry, Mary	/θ/	thin
		/ð/	then
		/v/	van
		/w/	wet
		/y/	yet
		/z/	zoo
		/ž/	azure

Other symbols

V	any vowel sound, or any vowel letter
V_c	any checked vowel spelled with a single vowel letter
V_f	any free vowel
C	any consonant sound, or any consonant letter
$\overset{.}{C}$	a syllable consonant sound
/ /	enclose pronunciation symbols
___	underlines letters
→	"is spelled"
/	"in the environment"
___	indicates the position of the sound under consideration
#	the beginning or the end of a word
( )	optional
{ }	either...or
≠	"is not"

For example, /f/ → ff / V_c___# can be read as, "The sound /f/ is spelled with the letters ff when (in the environment) after a checked vowel at the end of a word."

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